

AD-A046 389

DEFENCE AND CIVIL INST OF ENVIRONMENTAL MEDICINE DOW--ETC F/G 6/14
CURRENT LEVELS OF PHYSICAL FITNESS IN THE CANADIAN FORCES.(U)
AUG 77 W S MYLES, C L ALLEN

UNCLASSIFIED

DCIEM-TR-77-X-35

NL

|OF|
AD
A046389

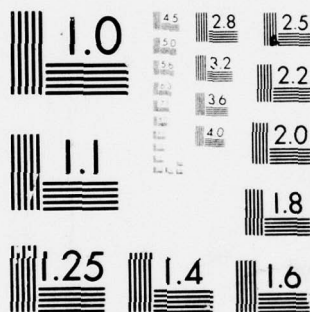


END

DATE
FILMED

12-77

DDC



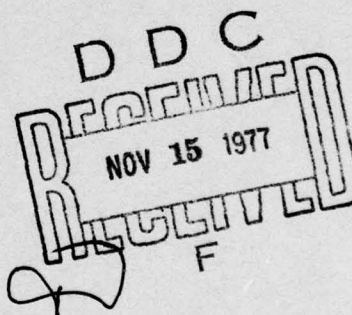
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

NTIS REPRODUCTION
BY PERMISSION OF
INFORMATION CANADA

DCIEM Technical Report No. 77X35

AD A046389

CURRENT LEVELS OF PHYSICAL FITNESS IN THE
CANADIAN FORCES



W.S. Myles
C.L. Allen

DEFENCE AND CIVIL INSTITUTE OF ENVIRONMENTAL MEDICINE
INSTITUT MILITAIRE ET CIVIL DE MEDECINE DE L'ENVIRONNEMENT

DEPARTMENT OF NATIONAL DEFENCE — CANADA

DDC FILE COPY

11 Aug 1977

12 16p.

9
DCIEM Technical Report No. 77X35

14 DCIEM-TR-77-X-35 ✓

6 CURRENT LEVELS OF PHYSICAL FITNESS IN THE
CANADIAN FORCES

10 W.S. Myles
C.L. Allen

Biosciences Division
Defence and Civil Institute of Environmental Medicine
1133 Sheppard Avenue West, P.O. Box 2000
Downsview, Ontario M3M 3B9

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

DEPARTMENT OF NATIONAL DEFENCE - CANADA

406986

Done

TABLE OF CONTENTS

	Page
ABSTRACT	v
INTRODUCTION	1
METHODS	1
RESULTS	2
DISCUSSION	2
ACKNOWLEDGEMENT	5
TABLES	6
FIGURES	8
REFERENCES	12

ACCESSION for	
NTIS	White Section <input checked="" type="checkbox"/>
DDC	Buff Section <input type="checkbox"/>
UNANNOUNCED	<input type="checkbox"/>
JUSTIFICATION	
BY	
DISTRIBUTION/AVAILABILITY COPIES	
Dis	S. CIVIL
A	

VO2
↓
ABSTRACT

Physical fitness was assessed for 2624 men aged 18-49 years serving in almost every segment of the Canadian Forces (CF). Aerobic power (VO_2 max) was predicted from heart rate measured during submaximal exercise and body composition was assessed by skinfold thickness measurements at three sites (triceps, subscapular and suprailiac). Officer cadets and infantry soldiers, aged 18-24 years, have a higher VO_2 max and less body fat than the rest of the CF population who appear to be little different, in that respect, from the civilian population in Canada. Young officer cadets and infantry soldiers lead a much more active life than the rest of the CF who, like most members of a modern military force, largely have sedentary duties. In the absence of a job-related requirement, physical fitness becomes a personal responsibility. A new rationale, one which places more emphasis on physical fitness as part of a healthy lifestyle, is required in the modern CF.

INTRODUCTION

The Canadian Forces (CF) encourage their personnel to keep themselves physically fit. To assist individuals in achieving this goal, they are assessed at least once a year by means of a 1.5 mile running test, or equivalent evaluation. Extensive facilities for sports and exercise are available on most military bases. Historically, the rationale for ensuring fitness in the military was based on the assumption that military duties involved a considerable amount of hard physical work. This assumption is no longer valid. Today, many Canadian servicemen have sedentary duties with less job-related requirement for physical fitness. For these individuals fitness has become a personal responsibility.

To determine the effect of a decreasing requirement for job-related fitness, a survey was carried out to assess the fitness level of male personnel from all segments of the CF. This paper reports measurements of aerobic fitness and body composition for these CF servicemen and comments on the relevance of physical fitness in the military context.

METHODS

Subjects

A total of 2624 male subjects were tested. Their ages ranged from 18 to 49 years and they represented almost every segment of the military population.

Aerobic power

Aerobic power (VO_2 max) was predicted from submaximal exercise using the MONARK bicycle ergometer. The total work period lasted ten minutes at a pedalling speed of 50 rpm. The first five minutes at a workload of 600 kg-m/min allowed the subject time to warm-up. The second five minute workload (usually 900-1200 kg-m/min) was selected to produce a heart rate which was 70-85% of maximum predicted from age. Heart rate was recorded using a Cambridge ECG. Heart rate and workload during the final minute were used to predict VO_2 max according to the nomogram of Astrand and Rhyning⁽¹⁾. Individuals were classified into one of four categories of VO_2 max (Figure 1) as adopted from the standards of Cooper⁽⁴⁾ and incorporating the Astrand⁽²⁾ age correction.

Body composition

Skinfold thickness was measured at three sites (triceps, subscapular and suprailiac) using Harpenden calipers. A total thickness for the three sites of less than 35 mm is considered lean, 35-

50mm as acceptable and more than 50 mm indicates too much body fat.

RESULTS

Table 1 shows the mean VO_2 max for four age groups in the CF, together with values for Canadian civilians tested by similar methods (3,5,6). Between the ages 18 and 49 years, the physical fitness level of the military population falls within the wide range of values observed among Canadian civilians. Table 1 also shows that VO_2 max declines with increasing age at about the same rate in both military and civilian populations.

Although the CF is an integrated force operationally, it is divided into land, air and sea elements. Table 2 compares VO_2 max for infantry soldiers, airmen, and sailors for three age groups. At 18-29 years infantry soldiers have an appreciably higher fitness level than airmen and sailors; at age 30-39 years, this difference is much less marked and it is entirely absent in the oldest age group.

Using values for VO_2 max, each individual was assigned to one of the four categories shown in Figure 1 with POOR and FAIR further identified as "unfit". Similarly, skinfold thickness measurements (sum of three sites) were categorized as less than 35 mm, 35-50mm and greater than 50 mm (too much body fat). Figure 2 shows the CF population divided into four age groups and shows the percentage of each group with a POOR or FAIR category of VO_2 max or with a skinfold thickness in excess of 50 mm. Among those 18-24 years of age the percentages who are unfit or have too much body fat are 34% and 20%, respectively. After age 25, these percentages increase to about 60% and 40%, respectively.

Figures 3 and 4 show the military population aged 18-24 years further divided into officer cadets, infantry soldiers and all other CF personnel tested. Whereas officer cadets have a compulsory fitness training programme and infantry soldiers participate in fairly strenuous field exercises, the rest of the CF population have much more sedentary duties. These differences are reflected in fitness levels and body composition. Figure 3 shows that for age group 18-24 years, the percentage of officer cadets, infantry soldiers and other CF personnel with a VO_2 max in the POOR or FAIR category (unfit) are 9%, 21% and 56%, respectively. Figure 4 shows that the percentages of each group with a skinfold thickness measurement in excess of 50 mm (too much body fat) are 5%, 15% and 33%, respectively.

DISCUSSION

This survey has attempted to relate physical fitness levels to

the limited requirement for job-related physical fitness in a modern military force. Since VO_2 max was measured for 2624 men of all ages and from almost every segment of the CF, the data can be considered to reflect current fitness levels in the Canadian military with reasonable accuracy. Mean values of VO_2 max for the CF fall within the very wide range of published values for Canadian civilians (3, 5, 6). Furthermore, 55% of CF's tested had a VO_2 max in the POOR or FAIR category and were therefore classified as "unfit". Cumming⁽⁵⁾ came to essentially the same conclusion regarding a civilian population in Winnipeg basing his assessment on criteria of fitness similar to those used in the present study. Although it is uncertain to what extent the published data (3, 5, 6) represent the national average, it appears that the physical fitness level of CF personnel is no different than that of their civilian counterparts.

Aerobic power declines with increasing age at about the same rate in both the military and civilian populations (Table 1). Although some of this decline must be due to the effect of aging, a considerable portion results from changes in lifestyle. The relationship between age, lifestyle and physical fitness is demonstrated more clearly in Figure 2 which shows that the percentages of the military population considered to be unfit or too fat, increases dramatically after age 24. The relatively healthy picture for the age group 18-24 years probably reflects the fact that many of them are involved in some kind of physically active training. After age 24, most military personnel have completed initial trade training and are beginning to practise their trade specialty. At the same time, marriage and domestic responsibilities may reduce the level of active participation in sports.

The relationship between daily activity level and physical fitness is further demonstrated by separating the officer cadets and the infantry soldiers from other personnel aged 18-24 years (Figure 3 and 4). Clearly the physical fitness training programme of the cadets and the active life of the young infantry soldiers results in relatively high levels of aerobic fitness and a much leaner body composition.

The available evidence seems to indicate that, unless their duties involve considerable physical work, the military in Canada have physical fitness levels no different from the rest of the population. Among the 2624 CF personnel tested in this study, less than half conform to the traditional image of the military man as one who keeps himself "fit and in shape". On the other hand, it is difficult to identify many military duties, other than the combat role of the infantry soldier, that require a high level of physical fitness as it applies to the capacity for prolonged hard work. Most military personnel today have jobs comparable to their civilian counterparts and it is perhaps not surprising that this study finds them

no more physically fit.

If, as we have suggested, the modern military profession no longer ensures a high level of physical fitness, a new rationale must be employed to realize this goal. A healthy lifestyle including additional regular exercise as appropriate for age and occupational category must be encouraged by all possible means. A recently introduced Life Quality Improvement Program is an attempt by the CF to reverse these trends and reduce the costs⁽⁷⁾. One of the earliest and most easily measured benefits of this initiative may be an increase in the level of physical fitness of CF personnel.

ACKNOWLEDGEMENT

The authors wish to acknowledge the contribution made by members, past and present, of the Exercise Physiology Section at DCIEM.

TABLE 1

A comparison of VO_2 max in Canadian military and civilian populations.

Military		Civilian		
Age group (years)	Mean VO_2 max (ml/kg.min)	Age group (years)	Mean VO_2 max (ml/kg.min)	
			Ref 3	Ref 5
18 - 24	46.4 (621)	20 - 29	36.4	44.0
25 - 29	39.7 (425)			
30 - 39	35.9 (921)	30 - 39	32.2	38.0
40 - 49	32.1 (657)	40 - 49	26.9	33.0
				36.4

Numbers of subjects tested are shown in parentheses. Of the two values quoted for Ref 5, 40 - 49 years, the higher is for industrial workers and the lower for office workers.

TABLE 2

Mean VO_2 max for land, air and sea
elements of the Canadian Forces.

Element	Mean VO_2 max (ml/kg.min)		
	18 - 29 yr	30 - 39 yr	40 - 49 yr
Land	47.6 (331)	37.5 (165)	31.7 (59)
Air	38.6 (248)	33.3 (323)	30.5 (267)
Sea	36.8 (157)	34.5 (111)	34.2 (22)

Numbers of subjects tested are shown in parentheses.

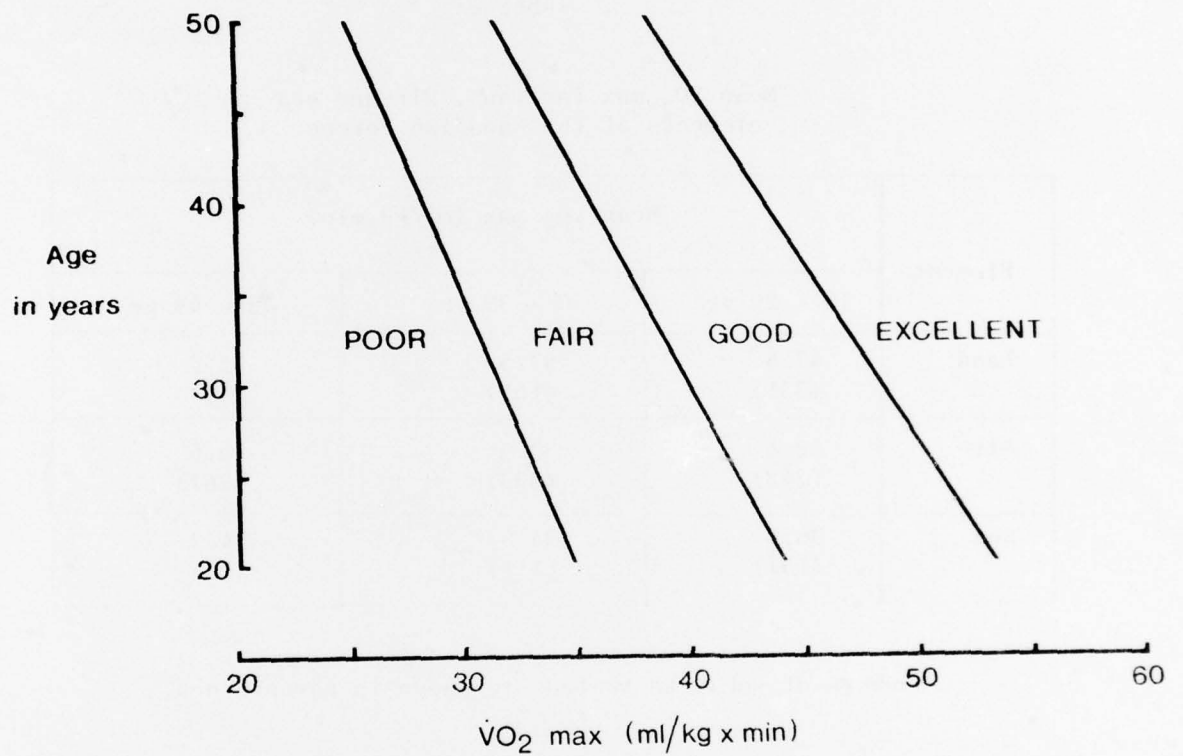


Figure 1: Categories of $\dot{V}O_2$ max for men, based on the standards of Cooper (1968) and incorporating the Åstrand (1960) age correction.

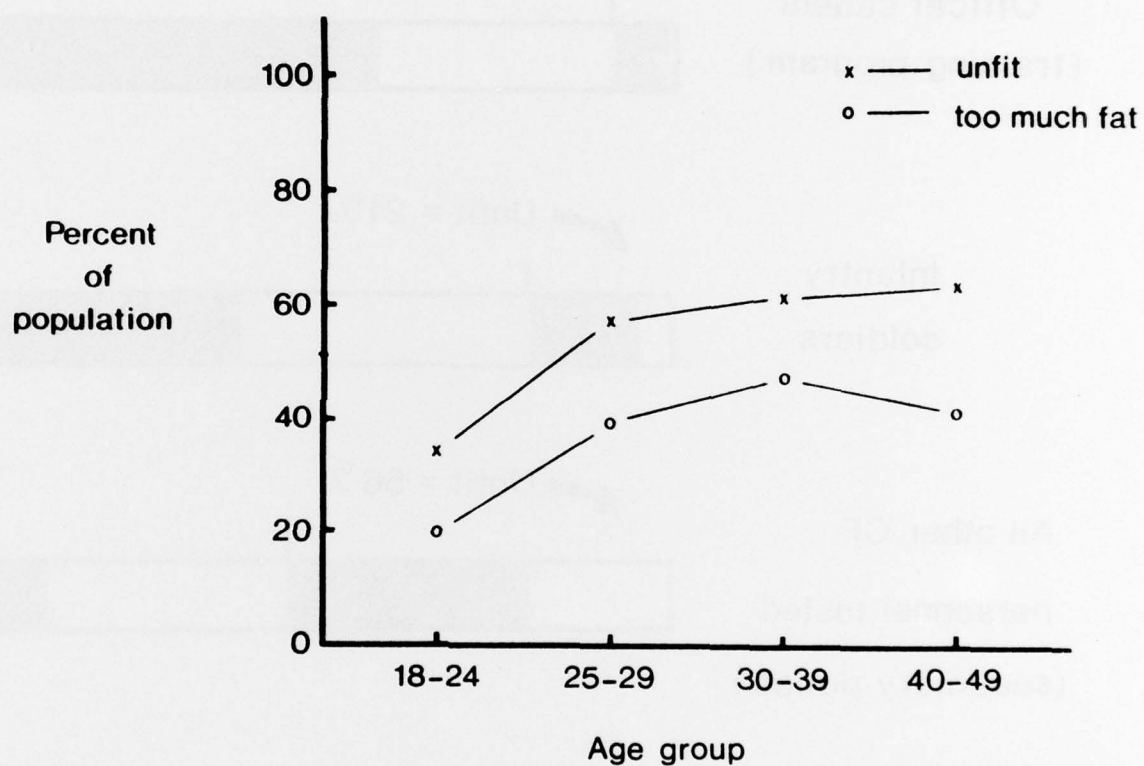


Figure 2: Percent of CF population with a VO_2 max in the poor or fair category (unfit) or with a skinfold thickness, sum of three sites, in excess of 50 mm (too much fat).

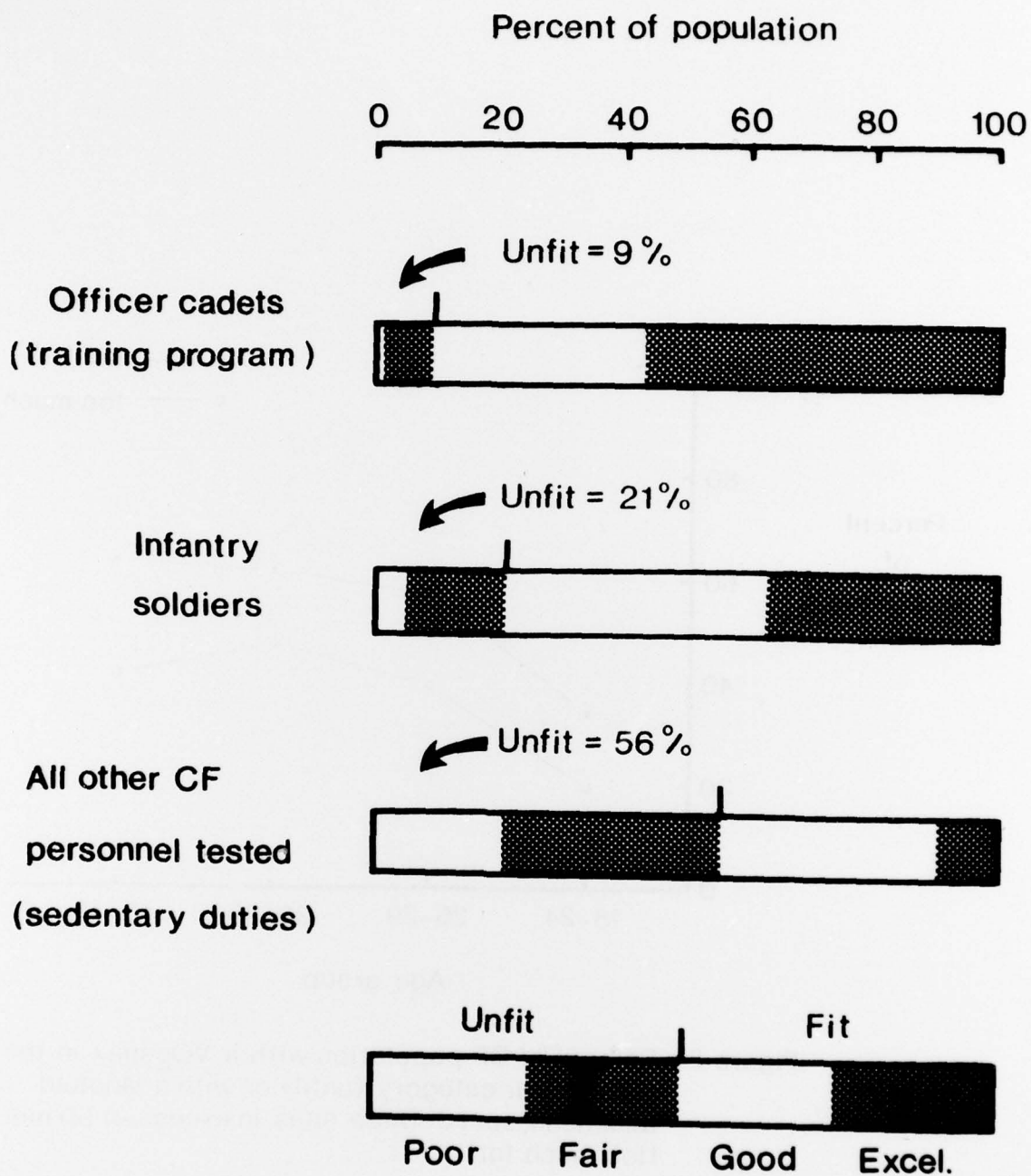


Figure 3: Distribution into categories of $\dot{V}O_2$ max for officer cadets, infantry soldiers and other CF personnel aged 18-24 years.

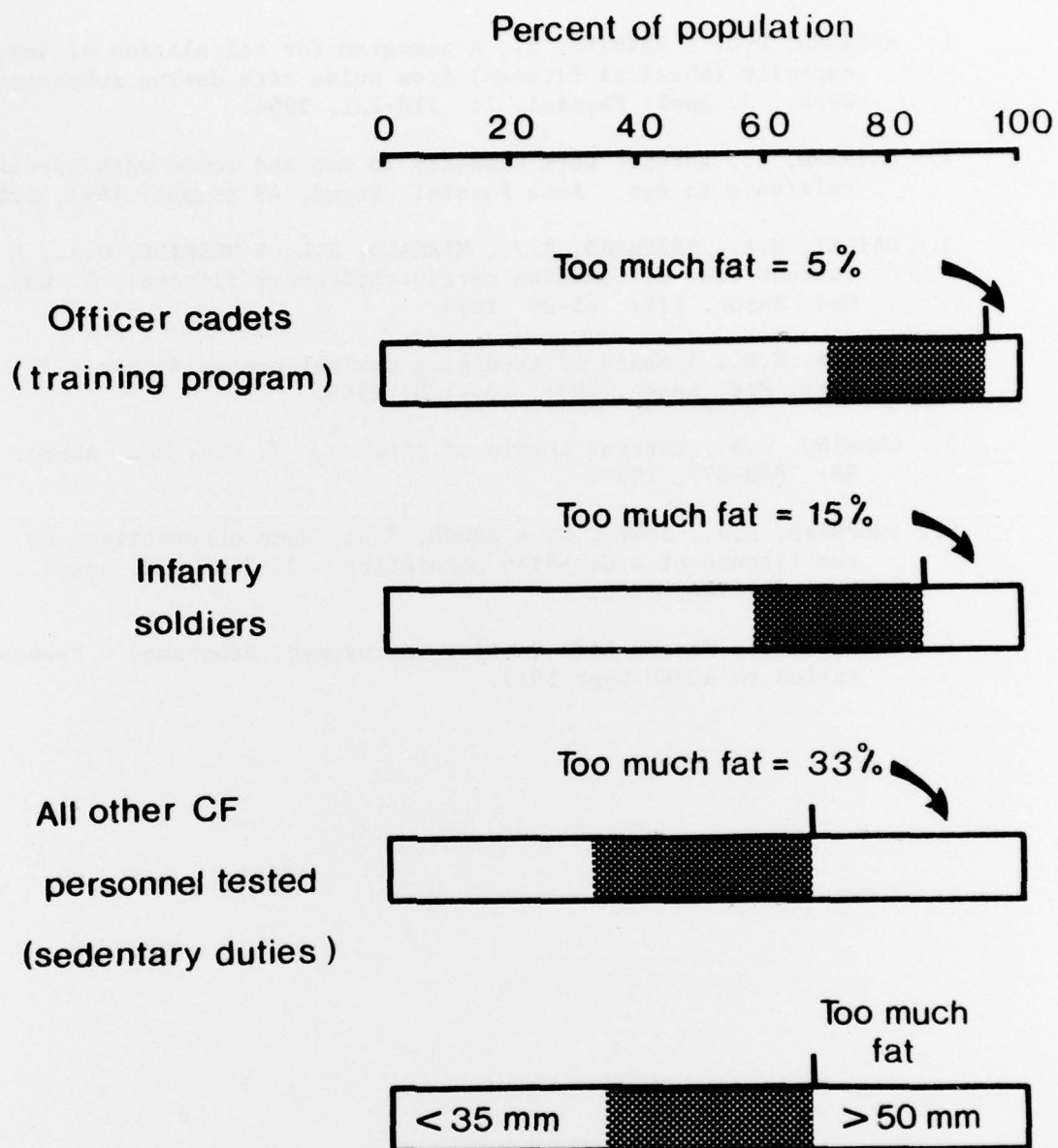


Figure 4: Distribution into categories of skinfold thickness for officer cadets, infantry soldiers and other CF personnel aged 18-24 years.

REFERENCES

1. ASTRAND, P.O. & RHYMING, I., A nomogram for calculation of aerobic capacity (physical fitness) from pulse rate during submaximal work. *J. Appl. Physiol.* 7: 218-221, 1954.
2. ASTRAND, I., Aerobic work capacity in men and women with special reference to age. *Acta Physiol. Scand.* 49 (Suppl. 169), 1960.
3. BAILEY, D.A., SHEPHARD, R.J., MIRWALD, R.L. & MCBRIDE, G.A., A current view of Canadian cardiorespiratory fitness. *J. Can. Med. Assoc.* 111: 25-30, 1974.
4. COOPER, K.H., A means of assessing maximal oxygen intake. *J. Amer. Med. Assoc.* 203: 135-138, 1968.
5. CUMMING, G.R., Current levels of fitness. *J. Can. Med. Assoc.* 96: 868-877, 1967.
6. SHEPHARD, R.J., JONES, G. & BROWN, J.R., Some observations on the fitness of a Canadian population. *J. Can. Med. Assoc.* 98: 977-984, 1968.
7. The Canadian Forces Life Quality Improvement Programme - Presentation to AGARD Sept 1977.